

### Patent Claims

1. A method for producing a reinforcement on a plastic pipe (1), comprising the following steps: providing a plastic pipe (1) that comprises at least one connection site (5) for connection to another plastic pipe (3) or to another connecting piece, said connection site (2) having a sealing area, and applying a reinforcement to said connection site (2) in said sealing area that substantially or completely prevents the plastic of said connection site (2) from creeping in said sealing area.
2. The method as recited in claim 1, characterized in that said reinforcement is applied solely in said sealing area of said connection site (2).
3. The method as recited in claim 1 or 2, characterized in that said reinforcement is applied by winding a reinforcing band (5) onto said connection site in said sealing area, said reinforcing band (5) being glued or heat-welded to said connection site (2).
4. The method as recited in claim 3, characterized in that said reinforcing band (5) is wound once around said connection site (2) and is then severed by cutting in order thereafter to heat-weld the end area of the wound-on reinforcing band (5) to the starting area [of] the wound-on reinforcing band (5), said end area optionally overlapping said starting area.
5. The method as recited in claim 3, characterized in that said reinforcing band (5) is wound more than once around said connection site, particularly in spiral and/or overlapping fashion, and is then severed, the end area of the wound-on reinforcing band (5) being welded or glued directly to said connection site (2) or to the immediately underlying winding of said reinforcing band (5).
6. The method as recited in one of claims 3 to 5, characterized in that said reinforcing band is welded to said connection site such that only the inner region of said reinforcing band (5) and the region of said connection site (2) to which said inner region of said reinforcing band (5) is to be welded is plasticized and melted before the welding takes place.

7. The method as recited in one of claims 3 to 6, characterized in that said reinforcing band is made of plastic, particularly thermoplastic plastic, polypropylene (PP) or high-density polyethylene (HDPE), and contains one or more reinforcing materials (47), particularly natural fibers, synthetic fibers, synthetic yarns, glass fibers, fiberglass fibers, Kevlar fibers, carbon fibers, metal fibers or metal wires and/or yarns or woven fabrics made of these reinforcing materials, oriented particularly in the longitudinal direction of said reinforcing band (5).
8. The method as recited in claim 1 or 2, characterized in that said reinforcement is applied by extruding a reinforcing plastic onto the sealing area and welding it to said connection site (2), the pipe being rotated one or more times relative to an extruder (45) having a shaped injection nozzle (51).
9. The method as recited in claim 8, characterized in that said reinforcing plastic is extruded together with reinforcing materials (47), particularly with natural fibers, synthetic fibers, synthetic yarns, glass fibers, fiberglass fibers, Kevlar fibers, carbon fibers and/or metal fibers, which are oriented particularly in the longitudinal direction of said reinforcing band (5).
10. The method as recited in claim 8 or 9, characterized in that said sealing area onto which said reinforcing plastic is extruded is warmed by irradiation or by hot air prior to the extruding-on process.
11. The method as recited in one of the preceding claims, characterized in that the applied reinforcement is calibrated and/or smoothed by means of a subsequent section bending roll (52).
12. The method as recited in one of the preceding claims, characterized in that the application of said reinforcement takes place only with only a locally acting thermal effect, thereby eliminating the need for either a cooling system or a mandrel that supports the connection site from the inside of the plastic pipe.
13. The method as recited in one of the preceding claims, characterized in that said plastic pipe (1) is a double-walled pipe with a corrugated outer wall and a smooth inner wall, and in that said connection site (2) is a sleeve.

14. A plastic pipe (1) comprising at least one connection site (2) for connection to another plastic pipe (3) or to another connecting piece, said connection site (2) having a sealing area, characterized in that applied to said connection site (2) in said sealing area is a reinforcement that substantially or completely prevents the plastic of said connection site (2) from creeping in the sealing area and is produced in particular by means of a method as recited in one of the preceding claims.
15. The plastic pipe as recited in claim 14, characterized in that said reinforcement is applied solely in said sealing area of said connector (2).
16. The plastic pipe as recited in claim 14 or 15, characterized in that said reinforcement is constituted by a reinforcing band (5) that is wound onto said connection site (2) in said sealing area, said reinforcing band (5) being glued or heat-welded to said connection site (2).
17. The plastic pipe as recited in claim 16, characterized in that said reinforcing band (5) is wound once around said connection site (2), the end area of the wound-on reinforcing band (5) being welded to the starting area of the wound-on reinforcing band (5).
18. The plastic pipe as recited in claim 16, characterized in that said reinforcing band (5) is wound more than once around said connection site (2), particularly in spiral and/or overlapping fashion, the end area of the wound-on reinforcing band (5) being welded or glued directly to said connection site (2) or to an immediately underlying winding of said reinforcing band (5).
19. The plastic pipe as recited in one of claims 16 to 18, characterized in that said reinforcing band (5) is made of plastic, particularly thermoplastic plastic, polypropylene (PP) or high-density polyethylene (HDPE), and contains one or more reinforcing materials, particularly natural fibers, synthetic fibers, synthetic yarns, glass fibers, fiberglass fibers, Kevlar fibers, carbon fibers, metal fibers or metal wires and/or yarns or woven fabrics made of these reinforcing materials, oriented particularly in the longitudinal direction of said reinforcing band (5).

20. The plastic pipe as recited in claim 14 or 15, characterized in that said reinforcement is applied by being extruded on and contains one or more reinforcing materials, synthetic fibers<sup>1</sup>, synthetic yarns, glass fibers, fiberglass fibers, Kevlar fibers, carbon fibers, metal fibers or metal wires and/or woven metal fabrics, said reinforcing materials being oriented particularly in the direction of extrusion.
21. The plastic pipe as recited in one of claims 14 to 20, characterized in that said plastic pipe (1) is a double-walled pipe with a corrugated outer wall and a smooth inner wall, and in that said connection site (2) is a sleeve.
22. A device for producing a reinforcement on a plastic pipe (1), particularly according to the method recited in one of claims 1 to 13, comprising a holding device for holding a plastic pipe having at least one connection site (2) for connection to another plastic pipe (3) or to another connecting piece,  
characterized in that said device includes an arrangement for conveying a reinforcing band (5) and an arrangement for winding said reinforcing band (5) onto said connection site of said plastic pipe, particularly onto a sealing area of said connection site.
23. The device as recited in claim 22, characterized in that said arrangement for winding-on said reinforcing band (5) is suitable for rotating said plastic pipe (1) relative to said arrangement for conveying said reinforcing band, and in particular comprises at least two support rollers (10, 11) on which said plastic pipe rests, at least one of said support rollers being driven by a motor (13), particularly a servo motor.
24. The device as recited in claim 22, characterized in that said arrangement for winding-on said reinforcing band is suitable for rotating relative to said plastic pipe said arrangement for conveying said reinforcing band, and in particular comprises a guide or a rotor (15) by means of which said arrangement for conveying said reinforcing band can be rotated by means of a motor, particularly an electric or servo motor, this movement being able to take place particularly in a reversible manner, so that at the beginning of a cycle the arrangement for conveying said reinforcing band can be returned to the starting position.

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<sup>1</sup> TRANSLATOR'S NOTE: Sic; the word "particularly" was probably omitted in error after "materials."

25. The device as recited in one of claims 22 to 24, characterized in that said device comprises an irradiating, hot air or laser apparatus (38, 39; 58), which is disposed in fixed relation to said arrangement for conveying said reinforcing band and which enables said reinforcing band to be welded to said connection site such that only the inner region of said reinforcing band and the region of said connection site to which said inner region of said reinforcing band is to be welded is plasticized and melted before the welding takes place.
26. The device as recited in one of claims 22 to 25, characterized in that said device comprises a section bending roll (40) by means of which the applied reinforcing band can be calibrated and/or smoothed.
27. The device as recited in one of claims 22 to 26, characterized in that said device comprises a cutting device (42) for cutting said reinforcing band (5).
28. The device as recited in one of claims 22 to 27, characterized in that said device comprises an irradiating, hot air or laser apparatus for welding the end area of said reinforcing band to the starting area of said reinforcing band.
29. The device as recited in one of claims 22 to 26, characterized in that said device comprises a laser apparatus (58) suitable both for cutting said reinforcing band (5) and for welding the end area of said reinforcing band (5) to the starting area of said reinforcing band.
30. The device as recited in one of claims 22 to 29, characterized in that said device does not comprises either a cooling system or a mandrel that supports the connection site from the inside of said plastic pipe.
31. The device as recited in one of claims 22 to 30, characterized in that said device includes a computer control, particularly for controlling the rotational movement, the severing of the reinforcing band and the welding, and, where applicable, for automatically bringing in and taking away the pipe that is being processed.

32. A device for producing a reinforcement on a plastic pipe (1), particularly according to the method recited in one of claims 1 to 13, comprising a holding device for holding a plastic pipe (1) having at least one connection site (2) for connection to another plastic pipe (3) or to another connecting piece, said device comprising an extruder (45) and a profile injection nozzle (51) for applying extruded plastic to said connection site (2) of said plastic pipe (1), characterized in that said extruder (45) comprises an arrangement (53, 54; 56) for feeding in one or more reinforcing materials.
33. The device as recited in claim 32, characterized in that said arrangement for feeding in reinforcing materials is a feeding device (56) suitable for feeding long-fibered or continuous reinforcing materials into the to-be-processed area after extruded plastic has emerged from the injection nozzle.
34. The device as recited in claim 32, characterized in that said arrangement for feeding in reinforcing materials is a feeding device (53, 54) suitable for feeding long-fibered or continuous reinforcing materials into the to-be-processed area, said feeding-in of reinforcing materials being effected through the injection head (50) for the profile nozzle (51).
35. The device as recited in claim 32, characterized in that said arrangement for feeding in reinforcing materials is a feeding device that feeds short-fibered reinforcing materials into the initial region of the extruder.
36. The device as recited in one of claims 32 to 35, characterized in that said device comprises an arrangement operative to rotate said plastic pipe relative to said extruder with injection nozzle and comprising in particular at least two support rollers (10, 12) on which said plastic pipe rests, at least one of said support rollers being driven by a motor (13), particularly a servo motor.
37. The device as recited in one of claims 32 to 36, characterized in that said device comprises an arrangement operative to guide said extruder (45) with injection nozzle along a circular path around said plastic pipe and comprising in particular a guide or a rotor by means of which said extruder (45) can be rotated by means of a motor, particularly an electric or servo motor, this movement particularly being able to take place in a reversible manner, so that at the beginning of a cycle the extruder with injection nozzle can be returned to the starting position.

38. The device as recited in one of claims 32 to 39, characterized in that said device comprises an irradiating, hot air or laser apparatus (38, 39; 58), which is disposed in fixed relation to said extruder with injection nozzle and which enables the to-be-processed subarea of said connection site to be plasticized and melted before the extruded plastic is welded to said connection point.
39. The device as recited in one of claims 32 to 38, characterized in that said device comprises a section bending roll (40) by means of which the applied reinforcing band can be calibrated and/or smoothed.
40. The device as recited in one of claims 32 to 39, characterized in that said device comprises a cutting device (33; 55; 58) for cutting said reinforcing material in the case of long-fibered or continuous reinforcing material, which cutting device can be a mechanical cutting device or a laser cutting apparatus.
41. The device as recited in one of claims 32 to 40, characterized in that said device does not comprise either a cooling system or a mandrel that supports the connection site from the inside of the plastic pipe.
42. The device as recited in one of claims 32 to 41, characterized in that said device includes a computer control, particularly for controlling the rotational movement and the extruder and for controlling any irradiating, hot air or laser apparatus, any feed device for the reinforcing material and/or any cutting device, and for controlling the automatic bringing in and taking away of the pipe that is being processed.
43. The device as recited in one of claims 32 to 42, characterized in that said arrangement for feeding in one or more reinforcing materials is suitable for feeding in the following reinforcing materials: natural fibers, synthetic fibers, synthetic yarns, glass fibers, fiberglass fibers, Kevlar fibers, carbon fibers, metal fibers or metal wires and/or yarns or woven fabrics made from these reinforcing materials.